WE CLAIM:

1. An isolated nucleic acid that encodes a plant fatty acid epoxygenase polypeptide.

2. The isolated nucleic acid according to claim 1 wherein the epoxygenase is a mixed-function monooxygenase that catalyzes the epoxygenation of a carbon bond in a fatty acid molecule.

3. The isolated nucleic acid according to claim 2, wherein the carbon bond is a double bond in an unsaturated fatty acid molecule.

4. The isolated nucleic acid according to claim 1 wherein the epoxygenase is a Δ12-epoxygenase.

5. The isolated nucleic acid according to claim 1 wherein the plant is *Crepis spp.* or *Vernonia spp.*

6. The isolated nucleic acid according to claim 5 wherein the plant is *Crepis palaestina.*

7. The isolated nucleic acid according to claim 5 wherein the plant is *Vernonia galamensis.*

8. An isolated nucleic acid encoding a plant fatty acid epoxygenase polypeptide comprising a nucleotide sequence selected from the group consisting of:

(i) a sequence having at least about 65% identity to a sequence selected from the group consisting of SEQ ID No: 1, SEQ ID NO: 3, SEQ ID NO: 5 and SEQ ID NO: 19 as determined using the default parameters of the Sequence and Analysis Software Package of the Computer Genetic Group (GCG) at the University of Wisconsin;

(ii) a sequence encoding an amino acid sequence that is at least about 65% identical to a sequence selected from the group consisting of SEQ ID No: 2, SEQ ID NO: 4, SEQ ID NO: 6 and SEQ ID NO: 20 as determined using the default parameters of the Sequence and Analysis Software Package of the GCG at the University of Wisconsin; and

(iii) a sequence that is complementary to (i) or (ii).

9. The isolated nucleic acid according to claim 8 comprising a nucleotide sequence that is at least about 65% identical a sequence selected from the group consisting of SEQ ID No: 1, SEQ ID NO: 3, SEQ ID NO: 5 and SEQ ID NO: 19.

10. An isolated nucleic acid from the plant *Vernonia* that encodes a fatty acid epoxygenase polypeptide wherein said nucleic acid comprises a nucleotide sequence selected from the group consisting of:

(i) the sequence set forth in SEQ ID NO: 19;

(ii) a sequence encoding the amino acid sequence set forth in SEQ ID NO: 20; and

(iii) a sequence that is complementary to (i) or (ii).

11. An isolated nucleic acid comprising the nucleotide sequence set forth in SEQ ID NO: 19 or a complementary nucleotide sequence thereto.

12. The isolated nucleic acid according to claim 1 wherein said nucleic acid comprises a nucleotide sequence that hybridizes under at least low stringency conditions to at least 20 contiguous nucleotides complementary to a sequence selected from the group consisting of SEQ ID No: 1, SEQ ID NO: 3, SEQ ID NO: 5 and SEQ ID NO: 19.

13. A gene construct that comprises the isolated nucleic acid according to claim 1 operably connected to a promoter sequence, wherein said nucleic acid is capable of being transcribed in the sense or antisense orientation relative to the direction of *in vivo* transcription of a naturally-occurring epoxygenase gene.

14. A gene construct that comprises the isolated nucleic acid according to claim 8 operably connected to a promoter sequence, wherein said nucleic acid is capable of being transcribed in the sense or antisense orientation relative to the direction of *in vivo* transcription of a naturally-occurring epoxygenase gene.

15. A gene construct that comprises the isolated nucleic acid according to claim 10 operably connected to a promoter sequence, wherein said nucleic acid is capable of being transcribed in the sense or antisense orientation relative to the direction of *in vivo* transcription of a naturally-occurring epoxygenase gene.

16. A method of altering the level of epoxy fatty acids in a plant or a cell, tissue, or organ of said plant, said method comprising introducing a gene construct comprising the isolated nucleic acid of claim 1 to a plant cell, tissue, or organ, regenerating said cell, tissue or organ into a whole plant and growing said plant under conditions sufficient to express said isolated nucleic acid in a cell, tissue or organ of said plant.

17. The method according to claim 16, wherein the isolated nucleic acid is expressed to produce a functional epoxygenase polypeptide in said cell, tissue, or organ.

18. The method of claim 16 wherein the plant organ is a seed.

19. The method of claim 16 wherein the plant cell, tissue or organ produces high levels of linoleic acid in its seed in its native state.

20. A method of producing a recombinant enzymatically active epoxygenase polypeptide in a plant cell, said method comprising:

(i) producing a gene construct that comprises the isolated nucleic acid of claim 1 operably under the control of a promoter that is operable in said plant cell;

(ii) transforming said gene construct into said cell; and

(iii) selecting transformants which express a functional epoxygenase encoded by the genetic sequence at a high level.

21. A plant transformed with the isolated nucleic acid according to claim 1.

22. A progeny of the plant according to claim 21 wherein said progeny also comprises said nucleic acid.

23. The plant of claim 21 selected from the group consisting of: *Arabidopsis thaliana*, Linola™ flax, oilseed rape, sunflower, safflower, soybean, linseed, sesame, cottonseed, peanut, olive and oil palm.

24. The plant of claim 23 consisting of an *A. thaliana* plant.

25. The plant of claim 23 consisting of a Linola™ flax plant.